Determining the Viability of the Kinect as a Research Tool

Matthew S Roscoe¹, Kenneth B. Kent¹, Rainer Herpers^{1,2}, and Paul G Plöger² University of New Brunswick¹ & Hochschule Bonn-Rhein-Sieg² Faculty of Computer Science

p0ep3@unb.ca / ken@unb.ca / rainer.herpers@h-brs.de / paul.ploeger@h-brs.de

Motivation

Modern day sensors for gathering 3D information are expensive and typically rely on laser based systems or even more expensive stereoscopic cameras. We evaluated the performance of the Kinect camera through the use of environment segmentation.

Background

This project looked directly at the use of the Microsoft Kinect as a replacement for more expensive and conventional 3D information gathering systems. The Kinect gathers information through the use of the structured light principle.

Results

The Microsoft Kinect provides a viable research tool for robotic systems that are constrained to an indoor based environment. Due to the Kinect using an Infra-Red sensor it is unable to obtain usable information in outdoor environments.





Environment segmentation is when we take the 3D information that was gathered about the environment and breaking it down into the components that make up the environment.



A Box and part of the ground being recognized. Segmented environment on the left RGB representation on the right. When using the Kinect in indoor based environments in conjunction with ROS & PCL it was found that the Kinect provided usable information in the following ranges:



Comparisons

The project also examined the benefits of using GPU (CUDA) based computation over CPU based computation. It was found that the GPU was the only solution to function in the desired 30Hz range.



CPU vs GPU End to End Computations

Much like the current sensors available (laser, stereoscopic, etc.) one of the Kinect's major pitfalls is the shadows that appear in the environment. With the Kinect this can be combated through the use of Simultaneous Locations And Mapping or through the use of multiple Kinect's who's images feeds are merged together.



UNIVERSITY OF NEW BRUNSWICK

